IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of: Larry D. Seiler et al.	Examiner: Motilewa Good Johnson
Application No.: 10/777,842	Group Art Unit: 2628
Filed: February 12, 2004	Docket No.: 00100.02.0039
For: **APPEARANCE DETERMINATION USING FRAGMENT REDUCTION**	

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

Dear Sir:

Appellant submits this brief further to the Pre-Appeal Brief Request for Review filed June 29, 2007, and the Notice of Panel Decision from Pre-Appeal Brief Review dated August 2, 2007, in the above-identified application.

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I. REAL PARTY IN INTEREST

ATI Technologies ULC is the real party in interest in this appeal by virtue of an executed assignment from the named inventors of their entire interest to ATI Technologies Inc. and an executed name change. The assignment evincing such ownership interest was recorded on February 12, 2004, in the United States Patent and Trademark Office at Reel 015096, Frame 0465. The Name Change was recorded on October 2, 2007, in the United States Patent and Trademark Office at Reel 019905, Frame 0613.

II. RELATED APPEALS AND INTERFERENCES

To Appellant's knowledge, there are no prior or pending appeals, judicial proceedings or interferences which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

III. STATUS OF CLAIMS

Claims 1-5, 7-8 and 14 are pending and stand rejected. Claims 6 and 10 are cancelled. Claims 9 and 11-13 are withdrawn. A copy of the pending and rejected claims 1-5, 7-8 and 14 is attached in Appendix A.

IV. STATUS OF AMENDMENTS

Claim 14 was added following the final Office action mailed on December 29, 2006. As understood by Appellant, claim 14 was not entered because it allegedly did not place the application in better form for appeal by materially reducing or simplifying the issues for appeal.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Display devices present images to the viewer as an array of individual picture elements or pixels. (Specification at ¶ 3). Each pixel is given a specific characteristic, such as the color of the image at the particular pixel's location. (*Id.*) Aliasing in an image may occur when a pixel sampling rate is less than the highest frequency change in an image. (*Id.* at ¶ 4). A highly detailed image with numerous changes in a short period of time will have a high frequency of change whereas a blank image has a zero frequency of change. (*Id*). Super-sampling and multisampling techniques/algorithms have been developed to provide order independent antialiasing. (*Id.* at ¶ 5). Conventional super-sampling and multisampling techniques/algorithms, however, require large memories and therefore increase the cost of systems employing the same. (*Id.* at ¶¶ 5-6).

Super-sampling algorithms generally compute multiple colors per pixel. For example, in systems where there are eight samples per pixel, super-sampling requires the computation and storage of eight colors per pixel. (Specification at ¶ 5). Multisampling algorithms generally compute a single color per pixel, together with a mask of the sample positions within the pixel that are covered by the primitive being rendered. (*Id.* at ¶ 6). In systems where there are eight samples per pixel, each of these samples must be stored in memory before the color associated with the pixel is determined. (*Id.*). Thus, conventional techniques are memory intensive and costly.

With reference to Figure 4 of Appellant's application, the Specification discloses an apparatus, such as a graphics processor 40, that includes a rasterizer 44 and a pixel appearance determination circuit (PADC) 46. (Specification at ¶ 21). In response to primitive information 43, rasterizer 44 generates fragment data 45 for a pixel to be rendered. (*Id.* at ¶ 23). A fragment is that portion of a primitive that intersects a given pixel. (*Id.* at ¶ 18). Fragment data 45 may

be, for example, location, color, luminance, depth, blending or alpha values of that portion of a primitive that intersects the pixel. (*Id.* at ¶¶ 18, 23). In one embodiment, a coverage mask is applied to a pixel to determine which sample points of a pixel lie within a given fragment. (*Id.* at ¶ 18). The PADC 46 determines a pixel appearance value 51 of a given pixel based on the fragment data 45 for each primitive that intersects the pixel. (*Id.* at ¶¶ 24-25). The pixel appearance value 51 may be, for example, a color value. (*Id.* at ¶ 18). In one embodiment, the pixel appearance value is provided to a display controller 52 where it is formatted for proper presentation on a display 54. (*Id.* at ¶ 26).

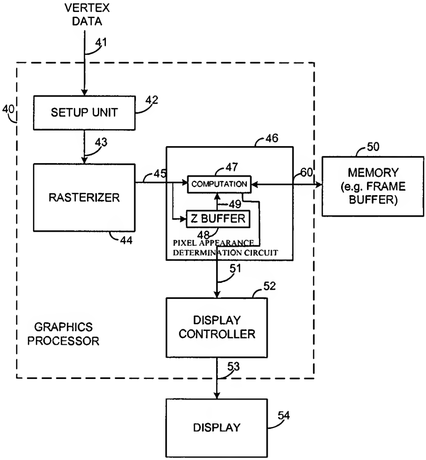

FIG. 4

CHICAGO/#1696692.1

Claim 1 includes, among other things, aspects of the rasterizer 44 and the pixel appearance determination circuit 46 (or PADC) as described above. Claim 1 is an apparatus that comprises:

> a rasterizer operative to generate fragment data for a pixel to be rendered in response to primitive information; and
>
> a pixel appearance determination circuit, coupled to the rasterizer, operative to determine a pixel appearance value based on the fragment data by dropping the fragment data having the least effect on pixel appearance, wherein dropping the fragment data further includes assigning the fragment data to be dropped with a no color designation. (Claim 1).

Returning to the Specification and the discussion with respect to Figure 4, when the amount of stored pixel fragment data for a given pixel exceeds the maximum number of fragments "N" to which a pixel can be associated (e.g., in memory 50), the PADC 41 determines which fragment data has the least effect on pixel appearance and drops this fragment data by providing or assigning a no color designation to the fragment data to be dropped. (Specification at ¶¶ 27, 28, 30, 31; FIG. 5A, elements 100-102). The Specification discloses that a variety of algorithms could be used to determine which of the fragment data should be dropped. (*Id.* at ¶ 30). For example, a first algorithm compares various colors present in the pixel and chooses the fragment data having the most redundant color as the fragment data having the least effect on pixel appearance. (*Id.*). In another example, a second algorithm compares depth values of incoming fragment data 45 to corresponding depth values of the fragment data maintained in memory and chooses that fragment data having a depth value that renders the fragment non-visible as the fragment data having the least effect on pixel appearance. (*Id.*). In yet another example, the fragment data covering the smallest number of pixel samples is chosen as the fragment data having the least effect on pixel appearance. (*Id.* at ¶¶ 30, 31, 39; FIGs. 6E, 7E).

The fragment data dropped may be newly received fragment data or previously stored fragment data. (*Id.* at ¶ 39).

In dropping the fragment data having the least effect on pixel appearance, the PADC 46 assigns the fragment data to be dropped with a no color designation. (*Id.* at ¶ 31). For example, PADC 46 may provide a storage location in memory associated with the fragment data having the least effect on pixel appearance (e.g., memory 50, which stores the fragment data 45 for each pixel) with a no color designation such that this dropped fragment data is not considered during a resolve period where a pixel appearance value 51 is determined. (Specification at ¶¶ 26, 31). For example and with reference to Figures 6A-6E (below), pixel 60 having pixel sample points illustrated as darkened circles may be associated with fragments 62-68. (*Id.* at ¶¶ 27-31). Fragments 62-66 (not shown below with reference to Figure 6E) may be associated with the color blue ("bl"), the color red ("r") and the color yellow ("y") and may "cover" or be associated with six of the eight pixel samples of pixel 60 as shown below. The background color, black ("b") may be associated with one of the pixel samples of pixel 60. It may be determined that fragment 68 (shown below), associated with the color green and associated with one of the pixel samples of pixel 60, has the least effect on pixel appearance. (*Id.* at ¶¶ 27-31). Although fragment 68 and its fragment data 45 is associated with the color green, fragment data 45 of fragment 68 will be assigned a no color designation (e.g., in memory 50).

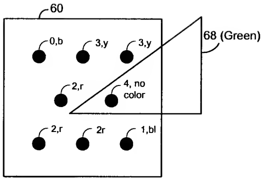

FIG. 6E

Assuming a multi-sampling technique is used to determine the pixel appearance value, the resulting pixel appearance value (e.g., color) would be: (1/7)(blue) + (3/7)(red) + (2/7)(yellow) + (1/7)(black). (Specification at ¶ 31). The no color designation causes a decrease in the valid subsamples from eight to seven. (*Id.* at ¶ 31). Without the dropping of fragment data having the least effect on pixel appearance and without assigning the fragment data to be dropped with a no color designation, the resulting pixel appearance value would have been (1/8)(blue) + (3/8)(red) + (2/8)(yellow) + (1/8)(black) + (1/8)(green). (*Id.* at ¶ 18), and thus would have required additional processing and memory.

Among other advantages, the present disclosure allows for a reduction in the frame buffer size. Thereby, the overall cost of a graphics processing system may be significantly reduced. (Specification at ¶ 15). The Specification teaches that the resulting image quality remains the same as the human eye is not generally able to perceive the color difference of a pixel element when multiple colors are blended together. (*Id.*).

In one embodiment, fragment data 45 may include masked sample data. (Specification at ¶ 36). In those situations and after a determination that fragment data includes such masked sample data, the non-masked fragment data is dropped (i.e., the masked fragment data is not dropped) and the masked fragment data is used to determine the pixel appearance value. (*Id.* at

¶¶ 36-37; FIG. 5B, elements 108-109; FIG. 5A, elements 104-405). This aspect of the disclosure is present, in large part, in claim 8, where the apparatus of claim 1 is further delineated such that:

> the pixel appearance determination circuit is further operative to determine whether the fragment data includes masked sample data, wherein the masked sample data is not dropped, and wherein the masked sample data is used to determine the pixel appearance value. (Claim 8).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-3, 5 and 7 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chen et al. (U.S. Publication No. 2003/0030642) in view of Jouppi et al. (U.S. Patent No. 6,204,859). Claim 4 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chen et al. (U.S. Publication No. 2003/0030642) in view of Jouppi et al. (U.S. Patent No. 6,204,859) and further in view of Duluk, Jr. et al. (U.S. Patent No. 6,476,807). Claim 8 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chen et al. (U.S. Publication No. 2003/0030642) in view of Jouppi et al. (U.S. Patent No. 6,204,859) and further in view of Everitt et al. (U.S. Publication No. 2004/0169651).

VII. ARGUMENT

A. THE OBVIOUSNESS REJECTIONS UNDER 35 U.S.C. § 103(a) TO CLAIMS 1-3, 4-5 AND 7 MUST BE REVERSED BECAUSE THE PUBLICATIONS DO NOT TEACH OR SUGGEST WHAT IS ALLEGED, AND THE OFFICE ACTION MISCHARACTERIZES WHAT IS CLAIMED

(i) *Claims 1-3, 4-5 and 7 stand or fall with independent claim 1.*

To establish a *prima facie* case of obviousness, among other things, the prior art references, when combined, must teach or suggest all of the claim limitations. MPEP § 2142. If a reference does not teach what is alleged, a *prima facie* case of obviousness has not been made. MPEP §§ 2142-2144; *see also* cited cases therein. The references and claim language cannot be mischaracterized in an effort to render a claim unpatentable. *See e.g., In re Rouffetti*, 149 F.3d 1350 (Fed. Cir. 1998), *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Also, there must be fact findings relating to the *Graham v. John Deere Co.* factors. *Graham v. John Deere Co.*, 383 U.S. 1 (1996), *see also, KSR Int'l Co. v. Teleflex Inc. et al.*, 127 S. Ct. 1727 (2007), *rev'd and remanded*, 2007 WL 2045626 at *1 (Fed Cir. 2007). For one or more of these reasons, the rejections should be reversed and the claims should be allowed.

Claims 1-3, 5 and 7 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chen et al. (U.S. Publication No. 2003/0030642) ("Chen") in view of Jouppi et al. (U.S. Patent No. 6,204,859) ("Jouppi"). Claim 4 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chen in view of Jouppi and further in view of Duluk, Jr. et al. (U.S. Patent No. 6,476,807). Claim 1 recites an apparatus comprising:

> a rasterizer operative to generate fragment data for a pixel to be rendered in response to primitive information; and
>
> a pixel appearance determination circuit, coupled to the rasterizer, operative to determine a pixel appearance value based on the fragment data by dropping the fragment data having the least effect on pixel appearance, <u>wherein dropping the fragment data further</u>

> includes assigning the fragment data to be dropped with a no color designation. (Emphasis added).

The final Office action mailed December 28, 2006 ("Final Office Action") alleges that Chen discloses all aspects of Appellant's claim 1 but that "Chen fails to disclose the dropping the fragment data with a 'no color' designation." (Final Office Action at p. 2). Appellant agrees that Chen fails to disclose assigning the fragment data to be dropped with a no color designation. The Final Office Action cites Jouppi at column 15, lines 28-33 for this claim feature and also alleges, by way of various citations to Jouppi, that the publication teaches receiving fragment data for a pixel to be rendered and further teaches determining an appearance value for the pixel. (*Id.* at pp. 2-3). Appellant disagrees because Jouppi does not appear to assign any such no color designation but rather utilizes a pre-existing alpha value to discard fragment data.

Jouppi appears to be directed to a method and apparatus for compositing colors of images in a graphics system where images are defined by pixels and where there are memory constraints for storing the pixel data. (Jouppi: title, abstract). The abstract of Jouppi teaches that:

> Multiple fragments of an image may be visible in any given pixel. Each visible fragment has a fragment value that includes the color of that fragment. For such given pixel, up to a predetermined number of the fragment values are stored. When a new fragment is visible in the given pixel, one of the fragment values is discarded to determine which fragment values are stored and subsequently used to generate the color of the pixel. The discarded fragment value may be the new fragment value or one of the stored fragment values. Various strategies may be used to determine which fragment value is discarded. (Emphasis added).

Jouppi further teaches that a fragment is determined to be visible, and thus susceptible to being discarded using one of the various strategies, by looking at Z-depth values and/or alpha values. (Jouppi: Col. 15, ll. 20-28, 34-37; Fig. 7, steps 702-704). Jouppi states that:

> If the new fragment has a smaller Z-depth value than the Z-depth value of a stored fragment for any covered subpixel sample S1-S4, then the new fragment is in front of that stored fragment and,

> consequently, is visible. An exception, however, is when the new fragment has an Alpha value of 0.0. In this instance the new fragment is completely transparent. The graphics accelerator 108 does not need to store the fragment value for the new fragment because the new fragment is, in effect, invisible. (Col. 15, ll.25-33) (Emphasis added).

Jouppi also explains that a fragment may be invisible if it is completely behind another non-transparent fragment (i.e., if it has a larger Z-depth value). (Jouppi: Col. 15, ll. 34-43). If the new fragment is invisible, the processing on the fragment is complete and the invisible fragment is discarded. (Jouppi: Col. 15, ll. 39-41, Abstract). Alternatively, when the new fragment is visible, further processing is performed on it to determine whether the new fragment should contribute to determining the pixel color. (Jouppi: Col. 15, l. 43- Col. 16, l. 29; FIG. 7, steps 710-720; Col. 6, ll. 56-63; Abstract).

If the fragment is visible, Jouppi teaches that the fragment is either saved in memory or used to replace a pre-existing visible fragment already in memory. In the former case, the fragment is stored in memory if a fragment triple (i.e., fragment value) in memory is free. (Jouppi: Fig. 7, steps 710, 712; Col. 15, l. 64- Col 16, l.5; Col. 5, ll. 9-11). In the latter case when no fragment triples in memory are free, a pre-existing, visible fragment triple in memory must be replaced. (Jouppi: Fig. 7, steps 710, 716; Col. 16, l. 6-12). As taught in Jouppi, "[r]eplacement means changing the color, Z-depth, and stencil values stored in the selected fragment triple to the color, Z-depth, and stencil values of the new fragment triple." (Jouppi: Col. 16, ll.9-12). The effect of the replacement is discarding the old fragment values (Jouppi: Col. 9, ll. 31-36). A variety of strategies or techniques may be used to determine which pre-existing, visible fragment triple in memory should be discarded by replacement. (Jouppi: Col. 9, l. 45 –Col 12, l. 39).

The Advisory Office action mailed May 1, 2007 ("Advisory Action") states that "[i]t is the interpretation of the Examiner that transparency meets the claim limitation of having no color designated. Applicant argues that a no color designation is not taught because Jouppi discloses using an existing alpha value to determine whether a fragment is invisible instead of <u>assigning</u> the fragment to be dropped a "no color designation". The cited portion of Jouppi discloses a new fragment with an alpha value of 0, and the new fragment is completely transparent, therefore no color is designated for the fragment." (Advisory Action, continuation sheet). Appellant disagrees.

Appellant notes that there is a difference between: (1) identifying fragments that are already associated with an alpha value of 0.0 (i.e., identifying invisible fragments) and discarding these fragments before subsequent processing of fragment data to determine a pixel color as taught by Jouppi; and (2) Appellant's claimed feature of determining a pixel appearance value based on fragment data by dropping the fragment data having the least effect on pixel appearance, <u>wherein dropping the fragment data further includes assigning the fragment data to be dropped with a no color designation</u>." (Emphasis added). Whereas the former is limited to the mere discardation based on a previously existing alpha-value identification, the latter instead <u>assigns</u> the dropped fragment data with a no color designation. No assignment and no color designation occurs in Jouppi because the alpha value is pre-existing and does not need to be assigned. In fact, the alpha value is only used to identify to Jouppi that the fragment should be discarded. Thus, Jouppi teaches the opposite of the above-referenced claim feature. Consequently, because of this difference between the cited publication and the claimed limitation, the combination of publications fails to teach or suggest each and every limitation of Appellant's claim 1 as alleged. For this reason alone, the Examiner's decision must be reversed.

Further, Appellant notes that the Advisory Action's statement that "[t]he cited portion of Jouppi discloses a new fragment with an alpha value of 0, and the new fragment is completely transparent, therefore no color is designated for the fragment", suggests that the Examiner has mischaracterized Appellant's claim. Appellant submits that the claim does not require that no color be designated or associated with invisible fragments. Instead, as repeated throughout this brief, the claim requires the <u>assignment</u> of fragment data to be dropped <u>with a no color designation</u>. Appellant therefore submits that the Examiner's interpretation of Appellant's claim amounts to an improper mischaracterization. In any event, Jouppi does not teach what is claimed because Jouppi appears silent as to any type of assignment of no color designations to fragment data to be dropped. Consequently, this application of Jouppi to the mischaracterized claims fails to provide a *prima facie* case of obviousness and the rejections should be reversed.

Finally, Appellants note that the Supreme Court standard of obviousness set forth in *Graham v. John Deere Co.* requires the Office to, among other things: (1) resolve the level of ordinary skill in the pertinent art; and (2) evaluate evidence of secondary considerations. MPEP § 2141. Appellants submit that neither the Final Office Action nor the Advisory Action meets this threshold as no level of ordinary skill in the pertinent art was resolved and no evidence of secondary considerations have been considered by the Office. (See generally, Final Office Action, Advisory Action). For this reason alone, the rejections must be reversed.

B. THE OBVIOUSNESS REJECTION UNDER 35 U.S.C. § 103(a) TO CLAIM 8 MUST BE REVERSED BECAUSE THE PUBLICATIONS DO NOT TEACH OR SUGGEST WHAT IS CLAIMED AND EVERITT TEACHES THE OPPOSITE APPROACH THAN WHAT IS CLAIMED

(i) <u>*Claim 8 stands or falls independent of any other claim.*</u>

To establish a *prima facie* case of obviousness, among other things, the prior art publications, when combined, must teach or suggest all of the claim limitations. MPEP § 2142.

The publications and claim language cannot be mischaracterized in an effort to render a claim unpatentable. *See e.g., In re Rouffetti*, 149 F.3d 1350 (Fed. Cir. 1998), *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). If a reference does not teach what is alleged, a *prima facie* case of obviousness has not been made. MPEP §§ 2142-2144; *see also* cited cases therein. A *prima facie* case of obviousness must also provide a proper motivation to combine references and cannot ignore statements in the prior art that teach away from the claimed invention. MPEP §§ 2141-2142. "A prior art reference must be considered in its entirety i.e., as a <u>whole</u> ...." MPEP § 2141.02 (Emphasis in original, discussing *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Circ. 1983). Also, there must be fact findings relating to the *Graham v. John Deere Co.* factors. *Graham v. John Deere Co.*, 383 U.S. 1 (1996), *see also, KSR Int'l Co. v. Teleflex Inc. et al.*, 127 S. Ct. 1727 (2007), *rev'd and remanded*, 2007 WL 2045626 at *1 (Fed Cir. 2007). For one or more of these reasons, the rejections should be reversed and the claims should be allowed.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chen in view of Jouppi and further in view of Everitt et al. (U.S. Publication No. 2004/0169651) ("Everitt"). Claim 8 is dependent upon independent claim 1 and further requires additional limitations as set for the below.

> wherein the pixel appearance determination circuit is further operative to determine whether the fragment data includes masked sample data, wherein the masked sample data is not dropped, and wherein the masked sample data is used to determine the pixel appearance value.

The Final Office Action, with respect to claim 8, states the following:

> Chen fails to explicitly teach that "wherein the masked sample data is not dropped, and wherein the masked sample data is used to determine the appearance value for the pixel.

> However, Everitt discloses (Figs. 1 and 4) a graphics processor having a rasterization pipeline (400) for determining a pixel appearance value (depth value) based on the fragment data by dropping the fragment data having the least effect on pixel appearance (if the depth values are outside the depth bounds, then the pixel or pixels in the fragment do not need to be rendered and can be discarded) (Page 4, section 32 and 35).
>
> Everitt further teaches "Stencil values are used to mask portions of the output image <u>during rendering</u>, and are used to render a variety of different effects, such as mirrors and shadows" (Section 17, lines 12-15). Everitt further discloses (Fig. 4) a stencil test unit (425) masks all or a portion of the fragment from rendering according to a stencil value stored in the stencil buffer (455) (Page 5, section 42).
>
> Therefore, it would have been obvious to a person of ordinary skill in the art to use the stencil values of Everitt to mask the portions of the fragment image of Chen to render a variety of different effects, such as mirrors and shadows, which would effect the appearance value for the pixel.
>
> (Final Office Action at pp. 4-5) (Emphasis in original).

The Advisory Action does not add any further comments with respect to claim 8. Appellant disagrees with the above-stated rejection for at least the reason that the Examiner ignores claim language and because Everitt appears to teach an opposite approach than the claimed subject matter.

Everitt appears to be directed to depth bounds testing and to a method and apparatus for efficiently rendering stenciled shadow volumes by avoiding the rending of unnecessary portions of shadow volumes into the stencil buffer. (Everitt: Title, Abstract, ¶ 7). Everitt appears to teach that these unnecessary portions of shadow volumes can be avoided by using, for example, a rasterization pipeline 400 of FIG. 4 or the similar pipeline 500 of FIG. 5 where a fragment and associated data representing all or a portion of a geometric primitive is tested by a variety of "units" to determine if fragment data is necessary or unnecessary for the scene. (*Id.* at ¶¶ 31-41; FIG. 4, steps 405-420). As used in Everitt, a fragment appears to be defined as all or a portion of

a geometric primitive. (*Id.* at ¶ 42). In other words, a fragment covers at least a portion of the pixels (one or more) associated with a scene. (*Id.* at ¶¶ 9, 35). Periodically, Everitt refers to fragments as image fragments. (*Id.* at ¶¶ 7, 30, 39, etc.). For example, Everitt appears to teach that a pixel ownership unit 405 may be used to discard portions of the fragment that are outside of the window or screen display area, that a scissor test unit 410 may be used to discard remaining portions of the fragment that are outside of the on-screen x and/or y range, that a depth bounds testing unit 415 may be used to compare depth ranges of the fragment with similar values previously stored in the portion of the depth buffer corresponding to a particular portion of the screen covered by the fragment, and that a stencil test unit 425 may be used to mask "all or a portion of the fragment from rendering according to a stencil value stored in the stencil buffer 455 [and to] modify the stencil values stored in the stencil buffer 455", etc. (*Id.* at ¶¶ 32-44). Other units may similarly be used to process the fragment data. For example, Everitt discloses a depth test unit 430, a blending unit 435, a dithering unit 440 and a logical operation unit 445. (*Everitt* at ¶¶ 43-44).

Using this pipeline 400, Everitt teaches that rendering of scenes with stenciled shadow volumes (e.g.. method 300) may be optimized. (Everitt: ¶¶ 48-55). For example, a method (e.g., method 300) of rendering a scene may create shadow volumes for light sources in a scene (step 315), and may render front-facing (step 320) and back-facing surfaces (step 325). The method of Figure 3 may be modified with the method of Figure 4 as taught with respect to Figure 5. (*Id.* at ¶¶ 48-53). With reference to Figure 3 (and thus also Figure 5) it appears that, in rendering each of these surfaces, stencil values for pixels are updated based on depth values. (*Id.* at ¶¶ 24-25). Thereafter, the scene can be rendered with the light source. (*Id.* at ¶ 26; Fig. 3, step 330). In the process of rendering the surfaces, "the stencil value associated with each pixel in the output

image" is read. (*Id.* at ¶ 26). If the pixel's stencil value is 0 (i.e., not-masked), and if there is a depth value match, color values are added and stored in the color buffer. Conversely, if the pixel's stencil value is not 0 (i.e., masked) then the color (presumably in the color buffer) is left unchanged. (*Id.*). "Essentially, the non-zero stencil buffer values 'mask' pixels inside one or more shadow volumes from being illuminated by the light source, creating a realistic shadow." (*Id.*).

First, the Final Office Action fails to address claim limitations. For instance, Appellant's claim 8 expressly requires that the pixel appearance determination circuit is further "operative <u>to determine whether the fragment data includes masked sample data</u>." (Emphasis added). A reading of the rejection (published above) in the Final Office Action makes clear that the Examiner wholly failed to address this claim limitation. For this reason alone, the rejection must be reversed.

Second, Appellant notes that even if the combination of Chen, Jouppi and Everitt taught or suggested determining whether the fragment data includes masked sample data, a position not taken by Appellant, the combination fails to teach or suggest not dropping the masked sample data and using the masked sample data to determine the pixel appearance value. For instance, Appellant notes that ¶ 26 of Everitt teaches the opposite approach where Everitt states that "[e]ssentially the non-zero stencil buffer values 'mask' pixels inside one or more shadow volumes from being illuminated by the light source, creating a realistic shadow." These masked pixels do not receive a color value and instead, the color values are left unchanged. (*Id.*) In other words, the masked pixels in Everitt are in shadow and do not appear to be used to determine a pixel appearance value. Only those pixels in Everitt that are not masked are given a color value as contributed by the illumination from the light source. (*Id.*). In contrast, Appellant

claims using masked sample data to determine the pixel appearance value. Thus, because Everitt appears to teach an opposite approach than the recited claim language and because no combination of the cited publications teach or suggest the claimed features, the rejection of claim 8 must be reversed.

Lastly, Appellants note that the Supreme Court standard of obviousness set forth in *Graham v. John Deere Co.* requires the Office to, among other things: (1) resolve the level of ordinary skill in the pertinent art; and (2) evaluate evidence of secondary considerations. MPEP § 2141. Appellants submit that neither the Final Office Action nor the Advisory Action meets this threshold as no level of ordinary skill in the pertinent art was resolved and no evidence of secondary considerations have been considered by the Office. For this reason alone, the rejections must be reversed.

VIII. CONCLUSION

For the reasons advanced above, Appellant submits that the Examiner erred in rejecting pending claims 1-5 and 7-8 and respectfully requests reversal of the decision of the Examiner.

Respectfully submitted,

Date: 11-2-07

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CLAIMS APPENDIX

CLAIMS ON APPEAL

1. (previously presented) An apparatus comprising:

a rasterizer operative to generate fragment data for a pixel to be rendered in response to primitive information; and

a pixel appearance determination circuit, coupled to the rasterizer, operative to determine a pixel appearance value based on the fragment data by dropping the fragment data having the least effect on pixel appearance, wherein dropping the fragment data further includes assigning the fragment data to be dropped with a no color designation.

2. (previously presented) The apparatus of claim 1, further including a memory, coupled to the pixel appearance determination circuit, operative to store the fragment data, the stored fragment data being used to generate the pixel appearance value.

3. (previously presented) The apparatus of claim 2, wherein the memory includes N locations per pixel for storing the fragment data, and when an N+1 fragment data is provided for a pixel, the pixel appearance determination circuit drops one of the N+1 fragment data.

4. (previously presented) The apparatus of claim 1, further including a display controller, coupled to the render back end circuit, operative to provide the pixel appearance value to a display.

5. (previously presented) The apparatus of claim 1, further including a setup unit operative to generate the primitive information in response to vertex information.

6. (canceled)

7. (previously presented) The apparatus of claim 3, wherein N has a value greater or equal to 3.

8. (previously presented) The apparatus of claim 1, wherein the pixel appearance determination circuit is further operative to determine whether the fragment data includes masked sample data, wherein the masked sample data is not dropped, and wherein the masked sample data is used to determine the pixel appearance value.

9. (withdrawn) A method for determining the appearance of a pixel, comprising:

receiving fragment data for a pixel to be rendered;

storing the fragment data; and

determining an appearance value for the pixel based on the stored fragment data, wherein at least one of the stored fragment data is dropped when the number of fragment data per pixel exceeds a threshold value, wherein dropping at least one of the stored fragment data further includes providing the dropped fragment data with a no color designation.

10. (canceled)

11. (withdrawn) The method of claim 9, wherein the threshold value is in the range of between 3 and 8.

12. (withdrawn) The method of claim 9, wherein before storing the fragment data, determining whether the number of stored fragment data exceeds the threshold value, and when the stored fragment data exceeds the threshold value dropping the fragment data having the least effect on pixel appearance.

13. (withdrawn) The method of claim 9, wherein before storing the fragment data, determining whether the fragment data includes masked sample data, wherein the masked sample data is not dropped, and wherein the masked sample data is used to determine the appearance value for the pixel.

14. (not entered) The apparatus of claim 1, wherein assigning the fragment data to be dropped with a no color designation comprises reducing a number of valid sub-sample locations in the pixel.

EVIDENCE APPENDIX

[NONE]

RELATED PROCEEDINGS

[NONE]

APPENDIX C